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Hawaii Agricultural Experiment Station

HONOLULU

J. M. WESTGATE, Special Agent in Charge

PRESS BULLETIN NO. 48

Suppression of Weeds Among Pineapples by Arsenite of Soda Spray

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Superintendent of Extension Work.

The Haiku region on the Island of Maui is noted for its large yields of fine pineapples. In years of good prices and normal rainfall the crop is a profitable one to grow. The season just closing, however, has been most disastrous because of prevailing low prices, bad roads caused by an unprecedented rainfall, and last but by no means least, an unusual growth of weeds which it has seemed almost impossible to bring under subjection.

Even in seasons of normal rainfall, which average about 75 inches per annum, the weed factor has always been an expensive item in the cost of producing pineapples. The usual contract price for weeding pineapple fields in this region is $2.50 per month per acre, or $30 per annum, for monthly weeding. At the present time, owing to the suspension of weeding during the excessive wet season, growers are paying $10 to $40 per acre to have their fields weeded, the average price being $20.

Under the conditions prevailing in the Haiku district, no sooner has a field been gone over than a new crop of weeds appears. In fact, the weeds are always present. It is a perennial fight to keep them under subjection. Under these conditions any practical methods of control will be welcomed, even if they help only partly to solve the problem.

It was with this view in mind that the writer began experimenting with arsenite of soda spray on his homestead last June.

Two lots of the arsenite of soda solution were made up for

FIG. 1.—*Arsenite of Soda Sprayer, showing skeleton frame over which protective covering is placed.*

comparative test, one according to the formula recommended by the Hawaii Experiment Station*, and the other in accordance with work done among sugar cane by Mr. C. F. Eckardt at Olaa.

*Hawaii Exp. Stat., Press Bull., No. 30, Killing Weeds with Arsenite of Soda.

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In the former formula 2 pounds of crystal sal soda and 1 pound arsenic is boiled in 1 gallon water until clear. "This stock solution is diluted in 24 gallons of water in the field and applied at the rate, roughly, of about 100 gallons of the dilute mixture per acre, more or less, according to the length and thickness of the growth."

This has been found effective on all the grasses and on the Hitchcock berry on the Nahiku Rubber Company's lands on Maui. The manager, Mr. W. A. Anderson reports that it has not been effective on "pualele (milk weed), ginger and wild taro.

FIG. 2.—*Arsenite of Soda Sprayer, with canvas guard to protect pineapple plants.*

For best results on honohono a little stronger solution, perhaps one gallon of stock mixture to 20 of water, is necessary." Further on Mr. Anderson says: "Hilo grass is actually disappearing from our fields that have been plowed, and thereafter, treated with the spray, considerable areas are free from it; it has been thinned out everywhere."

Our experience with this spray has been fairly effective. With us it quite effectively destroyed the young pualele, upon which Mr. Anderson found it ineffective. The so-called water grass (*Kyllingia brevifolia*) which is one of the worst weeds the Haiku pineapple grower has to contend with, especially during wet seasons, was but slightly affected, as well as some other weeds, notably the honohono, but even these succumbed to a second or third spraying when all conditions, especially that of the weather, were favorable. It will be noted that Mr. Anderson's normal spray solution contains about 4 pounds arsenic per 100 gallons, but that he recommends about 5 pounds for best results on honohono. One hundred gallons of spray are usually used per acre.

The first spray used by Mr. Eckart on Olaa Sugar Plantation, Hawaii, is substantially the same as far as the amount of arsenic is concerned as that used by Mr. Anderson at Nahiku Rubber Plantation on Maui. Both regions are characterized by heavy rainfall. The Olaa stock solution consists of 20 pounds white arsenic, 4 to 5 pounds caustic soda, and 10 gallons water. This is boiled for 10 to 15 minutes. Two and a half gallons of this stock solution are diluted to 100 gallons with water. Thus it will be seen that 100 gallons contains 5 pounds arsenic. But only about 1 pound of caustic soda is used at Olaa against about 8 pounds crystal sal soda as used at Nahiku. Theoretically the caustic soda would be about three times as efficient as the sal soda.

In the experiments among pineapples at Haiku, both sprays gave substantially the same results, which were as noted above. However, the main drawback to both these sprays, especially where the excess of caustic soda was used, was the caustic effect of the soda upon the operator. Whenever the spray came in contact with the skin there was trouble. It was with a view to ameliorate this condition that the formula given below was finally adopted at the suggestion of Mr. L. D. Larsen, of the Hawaiian Sugar Planters'

Association, and used with the results as recorded further on.

In July the solution was made up according to the following formula, soda ash being substituted for the sal soda:

5 pounds white arsenic, at 7½ cents per pound ..... .37½
5 pounds soda ash (carb. of soda), at 7½ cts per pound .37½
10 gallons water.

This was boiled for about 15 minutes or until the solution was clear. It was then diluted with water to make 100 gallons of solution ready for use. This amount was applied over approximately an acre of weedy land having a large proportion of manienie and Hilo grass. The results were quite as effective as with the sprays used by Anderson and Eckart, if not more so, but this may have been apparent rather than real, as the weather conditions may have been more favorable in the latter experiment. The important thing is that the caustic quality of the new spray was greatly lessened, and in this must lay its main advantage. However, there may also be a slight saving in the cost of using the soda ash in place of the caustic soda or the sal soda.

The former costs 3½ cents per pound, while the sal soda and soda ash cost about 2½ cents per pound at wholesale. Theoretically the soda ash is two or three times as efficient in combining with the arsenic as is the sal soda.

While the use of 5 pounds of arsenic per 100 gallons of water applied per acre was fairly efficient in destroying or at least suppressing most of the weeds encountered, the water grass (*Kyllingia brevifolia*) as well as the honohono were not materially affected. A second spraying within a week of the first application increased the suppression considerably. This suggested that doubling the strength of the solution might save spraying the weeds twice. Accordingly, in October, 10 pounds of arsenic and 5 pounds of soda ash were used to make up 100 gallons of solution. This has been very effectively applied to the following weeds: Pualele or sow thistle (*Sonchus oleraceus*) Rattle pod (*Crota-*

laria longirostrata), White wood (*Crotolaria var.*) Pig weed or purslane (*Portulaca oleracea*), Honohono (*Commelina nudiflora*), Manienie or Bermuda grass (*Cynodon dactylon*), Hilo grass (*Paspalum conjugatum*), Water grass (*Kyllingia brevifolia*) and the common guava.

These weeds were affected in about the order named. When young, say from three to six inches tall, most of the weeds turn brown in from two to three days, the young pualele usually wilts within ten to twenty hours after spraying, especially when the weather is bright and warm. Should it rain within 12 hours of spraying the effect may be nil or nearly so on all but the most tender weeds. When the weeds were nearly mature, it required fully four days before the full results were accomplished. While the honohono, water grass, and guava were not wholly destroyed in any case, they were suppressed to an extent that proved of great economic value.

Naturally, the spray affects all plant life with which it comes in contact. The pineapple is apparently unusually susceptible to the effects of the arsenite of soda, and it was soon found that every precaution must be taken to avoid contact.

The contrivance shown in figures 1 and 2 has proved highly efficient for the purpose intended. The spray tank used is of the well-known compressed air type, and has a capacity of three gallons liquid and one of air. This is lashed between the handles of a single wheel hoe, the tank resting securely on the iron frame to which are normally attached the weeding implements that go with this machine. On the outside of both handles, near the wheel, there is attached a light but strong iron rod which runs along the surface of the ground towards the operator until it reaches a point about where the operator's legs would be while walking. It then turns up to the handle bars. This forms a wedge shaped frame which parts the pineapple leaves, and when the frame is covered with light oiled canvas, provides a very effective guard against any of the spray reaching the leaves or

stems of the plants. The total cost of this outfit is not more than $15. The "Auto Sprayer" which was used in this instance cost $8.50. The single wheel frame $2.50, and the labor and material for assembling, about $2.50 more.

An active man can easily cover 2 acres per day of 10 hours among pineapples in rows planted 48 inches apart. This includes filling the tank from 50 to 60 or 70 times.

A larger tank, say one of 6 to 10 gallons capacity, would doubtless greatly increase the efficiency of the outfit and the writer has now under way the construction of a 10 gallon tank to fit into the triangular space between the handle bars of the same frame as shown in the figures. Any good spray nozzle which can readily be turned on and off will answer the purpose. It was found necessary, however, to redrill the aperture to a size and angle that will most effectively cause the spray to cover the area between the rows of pineapples under treatment. In the experiments thus far conducted between two-thirds and three-fourths of the space between the rows was successfully treated.

Weeding contractors have already offered to weed fields that have been sprayed, for half the amount asked on unsprayed areas. As the writer is now paying $10 to $20 per acre to have his pineapples weeded, the spraying will effect a saving of from $5 to $10 per acre less the cost of spraying.

The cost of spraying per acre as now practiced is about as follows:

Labor of spraying 1 acre of pineapples (½ day at $1.50)	$ .75
100 gallons spray solution:—	(max.)
5 to 10 pounds arsenic at 7½ cents	.75
2½ to 5 pounds soda ash at 7½ cents	.37½
Cost of preparing solution	.25
Spraying outfit, interest and deterioration	.17½
Total cost of spraying 1 acre	$2.30

The materials used in the spray can be bought, at wholesale,

for about one-third the prices given above, thus effecting a large saving. It is suggested that the pineapple growers of a district get together and buy their materials in original packages at wholesale.

It should be remembered that this method of weed suppression is comparatively new. In so far as the writer is aware, arsenite of soda spray has not been used among pineapples except in the demonstrations here reported. It is, therefore, not yet known what may be the effects of accumulated arsenic upon pines growing under conditions where the weeds are repeatedly sprayed. A word of warning is, therefore, given to operators to look carefully for signs of any possible injury that might result from the repeated use of arsenic spray among pineapples.